Phonon-electron coupling in luminescent defects in hexagonal boron nitride

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In the wide range of two-dimensional materials such as graphene and transition metal dichalcogenides, hexagonal boron nitride (hBN) provides a large band gap of around 6 eV. [1] This enables hBN to host defects with energy states deep inside in the electronic band gap, which are active at room temperature.

Using state-of-the-art optical photoluminescence, we identified defects in multilayer hBN with multiple phonon side bands. We observed a zero phonon line at a photon energy of 2.14 eV and two pronounced phonon side bands at photon energies of 1.98 eV and 1.81 eV. [2] A model treating the electronic states in the defects as a two-level system coupled to longitudinal optical phonons, shows very good agreement with our experimental data. Further explorations of defects in hBN will pave the way to a better understanding of the coupling mechanism between phonons and defects in low-dimensional materials. These studies have been carried out within the Center of Nanostructured Graphene (CNG).

[1] Tran T.T., Bray K., Ford M. J., Toth M., Aharonovich I. Quantum emission from hexagonal boron nitride monolayers. *Nature Nanotech.* **11**, 37-41 (2016).

[2] M. Fischer *et al.* (in preparation, 2018).